video RAM and Video RAM (VRAM)

Also see <u>A RAM Guide</u>.

Video RAM (video random access memory) means in general all forms of random access memory (<u>RAM</u>) used to store image data for a computer <u>display</u>. All types of video RAM are special arrangements of dynamic RAM (<u>DRAM</u>). Video RAM is really a <u>buffer</u> between the computer <u>processor</u> and the display and is often called the *frame buffer*. When images are to be sent to the display, they are first read by the processor as data from some form of main (non-video) RAM and then written to video RAM. From video RAM (the frame buffer), the data is converted by a RAM digital-to-analog converter (<u>RAMDAC</u>) into <u>analog</u> signals that are sent to the display presentation mechanism such as a cathode ray tube (<u>CRT</u>). Usually, video RAM comes in a 1 or 2 megabyte package and is located on the <u>video adapter</u> in the computer. Most forms of video RAM are *dual-ported*, which means that while the processor is writing a new image to video RAM, the display is reading from video RAM to refresh its current display content. The dual-port design is the main difference between main RAM and video RAM.

Somewhat confusingly, the most common type of video RAM is called Video RAM (VRAM). Video RAM is the <u>vanilla</u> flavor of video RAM. It is dual-ported, allowing the processor to write to it at the same time that it is refreshing the image on the display monitor. Other forms of video RAM include:

- Synchronous Graphics RAM (<u>SGRAM</u>) is clock-synchronized RAM that is used for video memory. It is relatively low-cost video memory. It uses *masked write*, which enables selected data to be modified in a single operation rather than as a sequence of read, update, and write operations. It also uses *block write*, which allows data for background or foreground image fills to be handled more efficiently. SGRAM is single-ported. Its special features are what make it a moderately fast form of video memory. The Matrox Mystique is an example of a video card that uses SGRAM.
- Window RAM (<u>WRAM</u>), unrelated to Microsoft Windows, is very high-performance video RAM that is dual-ported and has about 25% more bandwidth than VRAM but costs less. It has features that make it more efficient to read data for use in block fills and text drawing. It can be used for very high <u>resolution</u> (such as 1600 by 1200 pixels) using <u>true color</u>). It's used in the Matrox Millenium video card.
- Multibank Dynamic RAM (<u>MDRAM</u>) is a high-performance RAM, developed by MoSys, that divides memory into multiple 32 <u>KB</u> parts or "banks" that can be accessed individually. Traditional video RAM is monolithic; the entire frame buffer is accessed at one time. Having individual memory banks allows accesses to be interleaved concurrently, increasing overall performance. It's also cheaper since, unlike other forms of video RAM, cards can be manufactured with just the right amount of RAM for a given resolution capability instead of requiring it to be in multiples of megabytes.
- Rambus Dynamic RAM (<u>RDRAM</u>) is a video RAM designed by Rambus that includes a proprietary <u>bus</u> that speeds up the data flow between video RAM and the frame buffer. It's optimized for video streaming.

Selected Links

Matrox describes its Mystique video card with SGRAM and its Millenium card with WRAM.

Rambus has a Web site that describes how the Rambus DRAM works.

➧ <u>MoSys</u> has a brief description of its Multibank DRAM (MDRAM).

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